

navigable state throughout. The Ohio at Pittsburgh continued low (between 1 foot 0 inches and 2 ft. 6 in.) from the 1st to the 12th, when it rose to 4 ft. 8 in. by the afternoon of the 13th, it then gradually fell to 0 ft. 7 in. on the 23d, (lowest of the month) but rose to 7 feet 6 in. (highest of month) on the 27th; at Cincinnati and Louisville the river continued quite low, and without much change, throughout month. The Cumberland at Nashville, the Tennessee at Chattanooga, and the Monongahela at Morgantown, remained low throughout month, except the flood in latter on the 26th, which is noted under its appropriate heading. The Savannah continued below 4½ ft., except on the 19th and 20th, when it rose to 5 ft. 9 in., and on the 30th, when it rose to 9 ft. 6 in. The observer at Fayetteville, N. C., reported the Cape Fear river lower this season than at any time for the past ten years, the water at one time being so low that steamers could not get within nine miles of the city. The heavy rains during latter part of month caused a rise of about 15 feet. The observer at New Westminster, B. C., reported the Frazier river very high on the 25th, when it was 11 ft. 1 in. above low water.

TEMPERATURE OF WATER.

The *temperatures of water*, as observed in rivers and harbors, with average depth at which the observations were taken, are given on chart No. II. The observations at San Francisco were interrupted from the 19th to the 31st on account of breakage of thermometer.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—Thunder-storms have occurred in too large numbers during the month to allow of their being enumerated in detail. An examination of the storms, after being charted, shows that the greatest average number prevailed in the Middle Rocky Mountain slope, where from five stations an average of eight storms is reported. The Middle Atlantic and Lower Missouri valley and Lower Lakes average five, while New England, Upper Missouri valley, Upper Lakes and Eastern Gulf range from an average of four to four-and-a-half. Very few of these storms were reported from the Western Gulf, the Plateau districts and the Northwest, and none are reported from the Pacific coast.

Auroras.—The most extensive aurora of the month occurred on the 24th, being reported from New England as far south as Westborough, Mass., New York and several points in Dakota. Cloudy weather from Lake Erie to Lake Superior, occurring at that time, prevented observations in those districts. Its appearance and disappearance must have been nearly simultaneous from New England to Dakota, it being noted at 10 p. m. in both sections, and disappeared only at dawn. At Burlington, Vt., it was reported to have an arch of emerald green, with a few very brilliant streamers; its color was noticeably green at both Burlington and East port, and no rose spots seen. Mt. Washington observer, however, reported it as pale yellow, with streamers of deeper hue. At Buffalo its color was faint white. An aurora is reported from Milton, and Wills borough, Penn., on the 25th. On the 16th at Vevay, Ind., maximum brilliancy at 11:45 p. m.; on the 17th at Vevay and New Corydon, Ind., and Mt. Solon, Va.; on the 19th at New Corydon, Ind., at 10 p. m., and at Monticello, Iowa.

Magnetic Variation.—Prof. F. Hess reports the variation of the magnetic needle near Pagosa Springs, Col., July 2nd, as 14° 24' east, and on the 18th, near the Blanco river, Col., 14° 32'.

Atmospheric Electricity Interfering with Telegraphic Communication at Santa Fe, N. M., from the 7th to the 11th, and from the 18th, excepting the 21st, daily to the 28th inclusive; 10th, violent electrical storm on the summit of Pikes Peak, causing hair to stand out; for a considerable time buzzing noises emitted from all metallic substances; 12th, at Sloop Point, N. C.

OPTICAL PHENOMENA.

Solar halos.—Solar halos are reported in very considerable numbers from New England, the Lower Lakes, Ohio valley, and Upper Mississippi; but three are reported from the South Atlantic States, three in the Gulf States and one in the Northwest. Elsewhere none prevailed or have not been deemed worthy of report. A remarkable solar halo, a report of which was received too late for the June REVIEW, occurred on June 4th, at Port Blakely, Wash. Ter. The sun was surrounded by four distinctly marked rings, the two inner, which were perfectly round, displayed rain-bow colors, the third oval, and the fourth round in form, were white. A huge circle, also of rain-bow hues, passing through the sun's centre, intersected the rings described. A mock sun of blinding brilliancy appeared at the intersection of this outside circle with the lower half of the oval ring. The phenomenon continued for more than an hour.

Lunar halos.—These were reported in considerable numbers, especially in the sections south of 38° north and east of 100° west, where, however, only eight solar halos were reported. But two were reported west of the hundredth meridian, one at San Diego, and one at Santa Fé, and but four in the entire Lake region and Northwest.

MISCELLANEOUS PHENOMENA.

Polar Bands.—10th, at Tabor, Ia.; 7th, 11th, 16th, 27th, at Gardner, Me.; Cape Vincent, N. Y., on 24th; Jacksonsburg, O., on the 12th.

Prairie Fires.—Near Mason, Tex., on 16th, and in Virginia previous to the 24th.

Zodiacal Light.—Lynchburg, 14th, 16th, 18th, 21st.

Mirage.—Breckenridge, Minn., on the 20th; Olivet, Dak., on the 27th.

Pollen in air on 7th and 11th at Breckenridge, Minn.

Sand Storm on the 26th at Visalia, Cal.

Distant Lightning on the 23rd, at Visalia, Cal.

Cotton worm first seen on 31st, at Okalouska, La.

Grasshoppers 31st at Bismarek, doing much damage; Salt Lake City, disappeared near the end of the month; 29th, North Platte, locusts flying north, none alighted; Ringgold, Ohio, grasshoppers injuring tobacco from 12th to 19th; Kansas City, Mo., present during the month but did little damage.

Earthquakes, 26th, Cairo, Ill., at 11.45 a. m. lasting three seconds, motion from north to south; also felt at Mound City, Ill.

Sunsets—the characteristics of the sky at sunset, as indicative of fair or foul weather, for the succeeding twenty-four hours, have been observed at all Signal Corps Stations. Reports from 135 stations show, 4,164 observations to have been made, of which 37 were reported doubtful; of the remainder, 3,389 or 82.1 per cent were followed by the expected weather.

Sun Spots.—The following record of observations, made by D. P. Todd, Assistant, has been forwarded by Prof. S. Newcomb, U. S. Navy, Superintendent Nautical Almanac, Washington, D. C.:

| DATE— JULY, 1879. | No. of new— | | Disappeared by solar rotation. | | Reappeared by solar rotation. | | Total number visible. | | REMARKS. |
|----------------------|-------------|--------|-----------------------------------|--------|----------------------------------|--------|--------------------------|--------|--------------------|
| | Groups | Spots. | Groups | Spots. | Groups | Spots. | Groups | Spots. | |
| 1st, 3 p. m... | 1 | 1 | 0 | 0 | 1 | 1 | 2 | 4 | Faculæ. Faculæ. |
| 2nd, 3 p. m... | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | |
| 3d, 2 p. m... | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | |
| 7th, 2 p. m... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9th, 3 p. m... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 10th, 2 p. m... | 1 | 5 | 0 | 0 | 0 | 0 | 1 | 5 | |
| 11th, 2 p. m... | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | |
| 12th, 3 p. m... | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | |
| 14th, 3 p. m... | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | |
| 16th, 2 p. m... | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | Faculæ. Faculæ. |
| 16th, 2 p. m... | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | |
| 17th, 3 p. m... | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | |

Observations were also made on the 18th, 19th, 22nd to 24th, 26th and 28th at 2 p. m., and 21st at 3 p. m., but no spots seen. Mr. Wm. Dawson, observing at Spiceland, Ind., reports, the 1st, 29 spots in one group (the same that was near centre of S. E. quadrant on the 27th ult.), 1 spot and prominent faculæ at E. edge; 2d, 14 spots—4 very prominent—in large group, 2 or 3 spots at E. side of sun; 3rd, 15 spots—3 very prominent—in large group, 2 spots in E. quadrant; 5th, 1 spot of large group very near west edge, two spots in the other group a few degrees N.E. of centre; 10th, 14 spots, one group, about half way from east edge to centre; 11th, 20 spots, one group; 12th, 14 spots, one group, near centre, one spot quite large, with very prominent penumbra; 13th, 8 spots, one group, the large spot, near 8,000 miles long and about half as wide, penumbra fading; 14th, 15 spots, one group; 15th, 8 spots, one group; 16th, 10 spots, one group; 17th, 4 spots, one group, near west edge; 18th, no spots, large faculæ where the group was; 28th, 7 spots, one group a few degrees from S.E. limb; 29th, 4 spots, one group; observations were made, but no spots observed from the 6th to the 9th, 20th to the 27th, and on 30th and 31st. Mr. David Trowbridge, observing at Waterbury, N. Y., reports, 1st, 2 spots; 3rd, 1 spot near west margin; 5th, spot disappeared by solar rotation; 13th, group of at least 2 large and 1 small spots near centre; 14th, 1 large spot; on the 10th, 18th, 20th, 24th, 29th and 31st no spots were observed; Mr. F. Hess, of Ft. Dodge, Iowa, observing "in the San Juan valley, Col., reports 1st, 8 spots in two groups; 2nd, one large and two small spots; 12th, one large and one small spot." Prof. G. Hinrichs, in the Bulletin of the Iowa Weather Service, reports "a group of spots visible about the middle of the month." Observations were made throughout the month at Ft. Whipple, Va., but no spots seen. Mr. H. D. Gowey, North Lewisburg, Ohio, reports "on the 14th, at 7 a. m., local time, one spot quite large and two-thirds across the sun and near his equator."

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